CHAPTER 5

EXTERNAL COMPONENTS

5.1 INTRODUCTION

External components of an air cleaning system include fans, ductwork, dampers, louvers, housings, stacks, instruments, and other miscellaneous accessories that are associated with the movement, control, conveying, and monitoring of the air or gas flow.

This chapter contains information on the design, fabrication, materials, and codes and standards requirements/considerations for air cleaning system external components for nuclear facilities. Additional information can be found in Chapters 2 and 4, as well as ASME Code AG-1.[63]

5.2 DUCTWORK

This section will address the functional design, mechanical design, materials, coatings, supports, acoustic considerations, leakage, vibration considerations, and applicable codes and standards for ductwork for nuclear facilities.

5.2.1 FUNCTIONAL DESIGN

The sizing and layout of ductwork to provide desired air distribution, ventilation rates, transport velocities, and other functional requirements of the ventilation system are covered by the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) handbooks,[1, 2] the American Conference of Governmental Industrial Hygienists' (ACGIH) *Industrial Ventilation,*[3] and American National Standards Institute (ANSI) Z9.2.[4] The purpose of this section is to review the physical aspects of the duct system in relation to nuclear air cleaning and treatment. The least expensive first-cost duct layout may not be the most economical when the total annual cost of operating the system is considered. Short-radius elbows and other shortcuts in ductwork may seriously increase system resistance, which could require, for example, the use of a larger fan and/or fan motor with resulting higher operating costs, or conversely, they could make it impossible for the system, as installed, to operate at the desired level of performance. The physical layout of ductwork in a building is often compromised to conform to the confines of a building structure or design. This may be unavoidable when installing new ducts in an existing building. In new construction, consideration should be given to providing adequate space and optimizing the duct layout configuration in the earliest phases of building layout, i.e., long before the building design has been finalized. Adequate access (as described in Chapter 4) to filter housings, fans, dampers, and other components is vital to maintainability and testability. Allowance of adequate space for well-designed elbows, transitions, and fan inlets and outlets is vital to proper operation.

5.2.2 MECHANICAL DESIGN

Duct cost is influenced by the size and quantities of ductwork, construction materials, coatings used for protection against corrosion, construction methods (seams, joints, etc.), air-tightness requirements, erection sequence (including consideration of space limitations, post-erection cleaning requirements, etc.), and the number and type of field connections and supports (hangers, anchors, etc.) required. Consideration should be given to future modification, dismantling, and disposal of contaminated ductwork, particularly in the design of systems for commercial nuclear power plants, laboratories, experimental facilities, and other operations where change-out of the ductwork or removal for maintenance can be expected. Provision for adding on or changing ductwork is a consideration that is often overlooked in initial design.

Where space permits, a round duct is generally preferred to a rectangular duct because it is